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Original article

Use of the Radial Approach in Primary Angioplasty: Results in 1029 Consecutive Patients and Analyses in Unfavorable Subgroups

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ABSTRACT

Introduction and objectives: The transradial approach is associated with a reduction in vascular access-related complications after primary percutaneous coronary interventions. The purpose of this study was to examine the feasibility of the routine use of transradial access in primary angioplasty and to evaluate how it affects subgroups with less favorable characteristics.
Methods: We analyzed 1029 consecutive patients with an ST-segment elevation acute coronary syndrome treated with primary angioplasty.
Results: Transradial access was the primary approach in 93.1% of the patients. The success rate of primary angioplasty was 95.9%, and 87.6% of the patients were event-free 30 days after the procedure. Crossover was required in 3.0% of the patients with primary transradial access, and this rate remained stable over the years. Predictors of the need for crossover were age older than 75 years (odds ratio=2.50, 95% confidence interval, 1.09–5.71; *P*=.03) and a history of ischemic heart disease (odds ratio=2.65; 95% confidence interval, 1.12–6.24; *P*=.02). Primary transfemoral access use was higher in women older than 75 years. Use of the transradial approach in this subgroup did not affect reperfusion time or the success of angioplasty, although there was a greater need for crossover (10.9% vs 2.6%; *P*=.006). Among patients in cardiogenic shock, the transradial approach was used in 51.5%; reperfusion times and angioplasty success rates were similar to those obtained with transfemoral access, but there was a greater need for crossover.
Conclusions: Transradial access can be used safely and effectively in most primary angioplasty procedures. In older women and in patients in cardiogenic shock, there is a higher crossover requirement, with no detriment to reperfusion time.

El uso del acceso radial en la angioplastia primaria: resultados en 1.029 pacientes consecutivos y análisis en subgrupos desfavorables

Palabras clave:
Angioplastia coronaria
Cateterismo cardiaco
Complicaciones
Acceso radial

RESUMEN

Introducción y objetivos: El acceso radial reduce las complicaciones vasculares tras la angioplastia primaria. El objetivo es examinar la factibilidad del acceso radial sistemático en la angioplastia primaria y evaluar cómo afecta a los subgrupos menos favorables.
Métodos: Se ha analizado a 1.029 pacientes consecutivos con síndrome coronario agudo con elevación del segmento ST tratados con angioplastia primaria.
Resultados: En el 93,1% de los pacientes, el acceso radial ha sido el acceso primario. La tasa de éxito de angioplastia primaria fue del 95,9%, y el 87,6% de los pacientes estaban libres de eventos clínicos a los 30 días del procedimiento. La tasa de cruce vascular fue del 3,0%, estable durante el periodo estudiado. La edad mayor de 75 años (*odds ratio* = 2,50; intervalo de confianza del 95%, 1,09-5,71; p = 0,03) y la historia de cardiopatía isquémica previa (*odds ratio* = 2,65, intervalo de confianza del 95%, 1,12-6,24; p = 0,02) fueron predictores de necesidad de cruce. En las mujeres y los mayores de 75 años, el uso del acceso femoral primario fue mayor. Sin embargo, en este subgrupo de pacientes el acceso radial no afectó a los tiempos de reperfusión ni al éxito de la angioplastia, aunque sí se observó una mayor tasa de cruce (el 10,9 frente al 2,6%; p = 0,006). En los pacientes en *shock* cardiogénico, el acceso radial se utilizó en el 51,5% de los casos, con tiempos de reperfusión y tasas de éxito de la angioplastia similares a los del acceso femoral, aunque con mayor necesidad de cruce.
Conclusiones: El acceso radial se puede utilizar de manera segura y eficaz en la mayoría de las angioplastias primarias. En mujeres de edad avanzada y en pacientes en *shock*, aumenta la necesidad de cruce sin penalizar los tiempos de reperfusión.

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Abbreviations

PPCI: primary percutaneous coronary intervention
TFA: transfemoral access
TRUA: transradial/ulnar access

INTRODUCTION

Primary percutaneous coronary intervention (PPCI) is the preferred treatment for patients with ST-segment acute coronary syndrome (STEACS). Systematic use of this procedure improves the outcome of reperfusion in these patients, while bringing to light complications related to vascular access.[1,2] There is sufficient evidence that patients with periprocedural bleeding have an unfavorable prognosis.[3,4]

Although these complications are generally uncommon, several studies published since 2003 have shown that transradial/ulnar access (TRUA) is associated with a lower risk of developing such complications than transfemoral access (TFA), with no detriment to reperfusion time.[5–11] These studies, which are limited by the small number of patients included and by selection bias, have generated an ongoing debate in the scientific community since the first angioplasty procedure using radial access was reported in 1993 by Kiemeneij and Laarman.[12]

The results of the largest study comparing the surgical approaches used in PPCI were published in 2011.[13] Despite the growing evidence on this issue, there remains considerable controversy on the routine use of TRUA, based on the idea that this approach could affect the success of angioplasty and reperfusion time in specific patient groups. The interventional cardiology unit in our center has wide experience in TRUA (more than 90% of all angioplasties performed). The aim of this study was to evaluate the feasibility of the routine use of TRUA for PPCI in a high-volume center and to analyze its effect in patient subgroups with less favorable characteristics.

METHODS

Patients and Procedure

The analysis included all consecutive patients with an STEACS treated by PPCI in *Hospital Universitario Puerta de Hierro de Majadahonda* (Madrid, Spain) between January 2005 and December 2011. In our center, 85% of the patients with STEACS receive PPCI treatment.[14] PPCI was indicated in patients with symptoms of angina of less than 12 h' duration and ST-segment elevation greater than 0.1 mV in at least 2 contiguous leads on electrocardiography. Patients received dual antiplatelet therapy with a loading dose of 300 mg of acetylsalicylic acid and 600 mg of clopidogrel. Since 2011, patients younger than 75 years weighing more than 60 kg and with no history of previous stroke have received a loading dose of 60 mg of prasugrel, with a subsequent regimen of 10 mg daily.[15] In addition, during the procedure, an initial dose of 5000 IU of sodium heparin was administered, followed by 1000 IU for each additional 30 min' duration, as well as glycoprotein IIb/IIIa inhibitors, which in most patients was 2 intravenous bolus doses of eptifibatide 180 μg/kg, 10 min apart, followed by infusion of 2 μg/kg/min for 12 h.

The procedures were carried out by 5 interventional cardiologists highly experienced in performing TRUA. The primary access route was at the discretion of the operator. In most patients, the right radial artery was used, with a 6 Fr introducer. A spasmolytic cocktail containing verapamil was routinely used to avoid radial spasm. The introducer was withdrawn in the catheterization laboratory and various devices were used for TRUA hemostasis (TR-Band®, D-Stat®, and conventional access).

Definitions

- *Primary access:* the first vascular approach attempted, regardless of whether or not it was successful.
- *TRUA:* vascular access obtained in the wrist area, usually the right radial artery, and less often, the left radial artery or ulnar artery.
- *Crossover:* change of vascular access when the procedure could not be carried out through the primary access.
- *Successful PPCI:* angiographically-proven residual stenosis of less than 50% and TIMI flow greater than or equal to 2, and no death, reinfarction, acute or subacute thrombosis, or need for a new percutaneous or surgical revascularization procedure in the artery causing the infarction.
- *Needle-guidewire time:* time from the first radial puncture to passage of the angioplasty guidewire through the obstruction, in minutes.

Data Collection and Analysis

During catheterization, clinical cardiologists prospectively collected demographic data, the patients' baseline characteristics, and the procedure-related characteristics, and entered the information in the PPCI database of our center. A total of 1029 PPCIs were performed during the study period. A separate analysis was performed in 68 patients (6.6%) in cardiogenic shock (see "Special Subgroups: Patients in Cardiogenic Shock"), and 20 patients (1.9%) were excluded because their clinical status at presentation was unknown. Hence, 941 PPCI procedures formed the nucleus of our study (Fig. 1). Data were analyzed retrospectively at completion of the recruitment period.

Objectives of the Analyses

- *Primary aim:* To evaluate the feasibility of routine use of TRUA in PPCI, analyzing the crossover rate and the procedure-related variables (fluoroscopy time, needle-guidewire time, contrast volume, and angioplasty success rate).
- *Secondary Aims:*
  - To identify the clinical and procedure-related variables associated with a greater need for crossover or primary use of TFA. To characterize a less favorable patient subgroup using the above-defined variables.
  - To evaluate the effect of the use of TRUA in this less favorable subgroup, by analyzing the angioplasty success rate and the above-proposed procedure-related variables.

Qualitative variables were analyzed with the chi-square test for parametric data and the Fisher exact test for nonparametric data, and are expressed as rates or percentages. Quantitative variables were analyzed with the Student *t* test or analysis of variance for more than 2 measures, and are expressed as the mean (standard deviation). Survival is represented by Kaplan-Meier curves. Univariate and multivariate logistic regression analyses were used to identify the variables associated with a greater need for crossover or greater use of the femoral access. All tests were 2-tailed, and results were considered statistically significant at a *P* value of $<.05$. The statistical analysis was performed with SPSS (SPSS V.20.0 for Macintosh).